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BLOC INTERNATIONAL GEOPHYSICAL COOPERATION

- 1960

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INFORMATION ON SOVIET BLOC INTERNATIONAL GEOPHYSICAL COOPERATION - 1960

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INFORMATION ON INTERNATIONAL GEOPHYSICAL COOPERATION PROGRAM --

SOVIET-BLOC ACTIVITIES

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I. GENERAL

Gavriil Adrianovich Tikhov

On 25 January Gavriil Adrianovich Tikhov, academician of the Academy of Sciences, Kazakh SSR and Corresponding Member of the Academy of Sciences USSR, died in his eighty-fifth year.

His death marked the passing of one of the oldest astronomers of our country, a representative of the famous Pulkovo school of Russian astronomers.

G. A. Tikhov completed the Moscow State University, majoring in astronomy. He then studied at the University of Paris, while at the same time working at the Astrophysical Observatory at Meudon (near Paris). At the Pulkovo observatory G. A. Tikhov was occupied with scientific research for approximately forty years, and together with the late Academician A. A. Belopol'skiy organized the first Russian school of astrophysicists there.

In 1941 G. A. Tikhov transferred to Alma Ata, and from that time on worked within the structure of the Academy of Sciences, Kazakh SSR, since 1947 heading the Astrobotany Sector which was organized at his initiative.

Approximately two hundred scientific works are due to Gavriil Adrianovich Tikhov. Among his works are: deflection of light rays in the field of gravity of stars; the great catalog of the color of stars, determined by the new method of the linear spectrograph; results of observations of the Moon, Mars, Neptune and Uranus; determination of the temperature of the solar corona by color; discovery of the dispersion of light in universal space; the scintillation of stars and its angular diameter; improvement of aerial prospecting; investigation of the "green flash" and anomalous dispersion in the earth's atmosphere, and the blueness of the sky.

The scientist devoted the major portion of his life to investigation of the planets, particularly Mars. Studying the optical properties of terrestrial plants growing under severe climatic conditions in the Arctic, the Tundra, and in the high mountains of Tyan'-Shan' and Pamir, G. A. Tikhov explained many complex optical properties of the "seas" of Mars, proposing the presence of plant life on that planet. Gavriil Adrianovich also laid the foundations of a new field of science: astrobotany.

In 1927 G. A. Tikhov was elected a corresponding member of the Academy of Sciences USSR, and in 1946 was made a member of the Academy of Sciences, Kazakh SSR. For his scientific activity G. A. Tikhov was awarded many degrees by Russian scientific societies, and also by the Paris Academy of Sciences.

The scientist-astronomer conducted great work in the propaganda of scientific knowledge, was president of the Alma-Ata division of VAGO,

and was a member of the Presidium of the Society for the Dissemination of Political and Scientific knowledge, as well as an active lecturer for this organization. G. A. Tikhov devoted much energy to social work, and he thrice was elected deputy to the Supreme Council of the Kazakh SSR.

The self-sacrificing work of the outstanding scientist was evaluated highly by the party and by the government: he was awarded the Order of Labor Red Banner, the medal "For Valorous Work in the Great Fatherland War of 1941-1945, and was awarded Honorary Diplomas by the Supreme Soviet USSR and by the Supreme Soviet, Kazakh SSR.

G. A. Tikhov was a very erudite scientist, an enthusiast in his affairs, and an extremely sensitive and sympathetic man. A bright memory of him will live eternally in our hearts. ("Gavriil Adrianovich Tikhov," by N. U. Bazanova, et al., Vestnik Akademii Nauk Kazakhskoy SSR, No 2(179), 1960, pp 100-101)

Toward New Pinnacles of Science

The Lenin Prize has been awarded to Corresponding Member of the Academy of Sciences USSR S. N. Vernov, Doctor of Mathematical Physics A. Ye. Chudakov, and scientific associates N. V. Pushkov and Sh. Sh. Dolginov for the discovery and investigation of the outer radiation band of the Earth, and for investigation of the magnetic fields of the Earth and Moon. These investigations enriched the recently founded and rapidly developing science of the physics of space. The Soviet scientists developed new methods and an original, promising and efficient instrument for investigation of various types of radiation and magnetic field at high altitudes and in cosmic space. This instrument, installed in Soviet artificial earth satellites and space rockets, enabled discovery and detailed study of various phenomena, thereby enriching contemporary science with new data.

S. N. Vernov and A. Ye. Chudakov discovered and studied the outer radiation zone around the Earth and established a general picture of the distribution of charged particles in cosmic space.

N. V. Pushkov and Sh. Sh. Dolginov made a great contribution to the physics of space. Designing a new magnetic instrument based on new principles, they conducted measurements of magnetic fields in the outer radiation zone of the Earth. These measurements showed the presence of intraionospheric electric currents. The establishment of the fact of the lack of a magnetic field around the Moon is a great achievement of Soviet scientists.

The work of N. G. Chetayev on the theory of stability has great influence upon the establishment of the Soviet school. In our time problems of stability have very important theoretical and applied significance. At present technicians and physicists more and more frequently are being confronted with tasks relating to this field of science.

N. G. Chetayev generalized and developed further the noted works of the outstanding Russian scientist A. M. Lyapunov on the stability of motion, and made possible the practical application of this theory. He developed a method enabling resolution of a large number of problems of the stability of motion of a solid body. The significance of the work of N. G. Chetayev, having great applied significance in ballistics, making precision instruments and in other fields of science and technology, has been highly evaluated with the awarding of the Lenin Prize.

The Committee for the Lenin Prize granted a large reward to Professor A. Ye. Kriss for his scientific work "Marine Microbiology (at great depths)." Professor Kriss has investigated all our Soviet seas from the surface to the greatest depths. He also investigated the waters of the Central Arctic, the Pacific and Indian oceans. He also has established a complete picture of the quantitative determination, species composition, speed of reproduction and the role of bacteria in the general processes of the biological productivity of the sea. He also discovered and described in detail the extensive distribution in the deep waters of the seas and oceans of previously unknown classes of microorganisms. The biological works of Kriss also unexpectedly illuminated many hydrological problems of science. ("Toward New Pinnacles of Science," by Academician A. N. Nesmeyanov, President of the Committee on Lenin Prizes in the Field of Science and Technology, Pravda, 22 April 1960, p 2)

II. ROCKETS AND ARTIFICIAL EARTH SATELLITES

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On the Agenda -- Space!

In its very first steps in knowledge of the world mankind turned its attention to the stars, the planets and the Sun. According to these the time of the year and hours of the day, and the location of ships on the open sea were determined...

At present in our country, the homeland of the renowned artificial earth satellites and moon rockets, not only specialists in astronomy, but also hundreds of amateurs are occupied with conducting observations of celestial bodies and phenomena. Their work is unified and directed by the All-Union Astronomical-Geophysical Society, which has at its disposal numerous observatories and scientific stations.

The results of investigation of the Universe conducted during recent years were evaluated by the third session of the society, which recently concluded at Kiev. V. Belikov, a correspondent of "Nedel'," turned to a participant at the session, Moscow astronomer and university lecturer F. Yu. Zigel' with several questions.

Question: What new contributions to science have been made in recent years by the investigations of members of the Society?

Answer: Permit me to recount only the most important of these works. During the International Geophysical Year members of VAGO conducted basic observations of the so-called "silvery clouds" which are formed in the wintery atmosphere at very high altitudes. The particles of which they are composed were successfully explained. During the last great opposition of Mars approximately 1,300 photographs of this planet were taken at the observatory of the Stalingrad planetarium, from which the development of various processes in the martian atmosphere were successfully traced. Approximately 2,500 "falling stars" were registered by the Simferopol meteorite station. The geodeticists also conducted very fruitful work. The Odessa, Tallinn and Yerevan sections of VAGO studied vertical motions of the Earth's crust by geodetic means.

Question: Which reports evoked the greatest interest of participants at the session?

Answer: The reports covered almost all divisions of modern astronomy. The report of Leningrad professor V. V. Sharonov on the results of investigations of Mars during the years 1954-1958 evoked great interest. During this period unusually intense processes were observed in the atmosphere of Mars, apparently caused by the Sun. At the end of August 1956 a yellow haze, supposedly as a result of a dust storm, covered most of the space above the surface of Mars and completely prevented exposure of its polar cap to the Earth. In October of the same year Professor N. P. Barabashov at Khar'kov observed very clear white spots on the surface of the same planet, possibly consisting of special spots covered by something else.

Somewhat earlier a large new greenish spot was noted on the surface of Mars, called "the patch of Slayfer." In its optical characteristics this patch is similar to the martian "seas," and its area is equal to the territory of the Ukraine. For several years observations of its shape practically have not changed, although its coloring is subject to seasonal fluctuation, such as the coloring of the "seas." The cause of this phenomenon still has not been explained.

Investigations of the spectrum of Mars not long ago indicated that water vapor and oxygen are contained in its atmosphere in an amount at least 1,000-fold less than in the Earth's atmosphere. However, this situation does not exclude the possibility of the existence of life on the planet.

Question: Were problems connected with other planets of the solar system discussed at the session?

Answer: In a report on the nature of Venus, the director of the State Astronomical Institute imeni Shternberg, Professor D. Ya. Martynov, reported on the latest results of investigations of our celestial "neighbor." Water vapor was discovered in the atmosphere of Venus in the same relative amount as in the atmosphere of the Earth.

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The temperature of the surface of Venus also was successfully determined by radio methods. It was found to be very high -- approximately 200 degrees above zero!

It is possible that the radio irradiation of Venus is in part of a non-heating nature, and then this figure may be considerably reduced.

The report of Professor S. K. Vsekhsvyatskiy (Kiev) was connected with an interesting problem. In his opinion a very rarified ring of meteorites, similar to the "rings" of Saturn, must exist around Jupiter. However, this extremely interesting hypothesis still must be subjected to careful testing through observations.

Unfortunately it is impossible to speak briefly and on a popular level of the content of many of the other reports.

Question: Was any light thrown on the problems of astronautics at the session?

Answer: Yes, this question was accorded an appropriate place. In his report, "Investigation of Cosmic Space with the Aid of Rockets and Artificial Earth Satellites," Professor K. F. Ogorodnikov (Leningrad) spoke on the possibilities of the utilization of space rockets for astronomical purposes. In particular, it will be possible in the future to place an automatic station on the surface of the Moon, which may transmit to the Earth detailed images of the lunar relief.

The report of MGU Aspirant I. D. Novikov evoked great interest. In the report several effects which may be observed from photon rockets were taken into consideration. It is obvious that with the motion of photon rockets at speeds near to the speed of light the map of the Universe as seen by the cosmonauts must be markedly altered.

Thus, for example, as a result of the phenomenon of aberration (addition of the speed of the rocket with the speed of light) all stars will undergo an apparent displacement in the direction of the point toward which the photon rocket is moving. As a result the constellations are unrecognizably deformed: before the rocket, directly in the line of its course, a multitude of stars will be seen, but behind the rocket there will be black, an almost starless void.

Furthermore, the "Doppler effect" also will come into consideration, through changes in the color of stars approaching, or receding from the rocket. To the inhabitants of the photon rocket it will appear as though the stars in the direction of which the flight is being made are "hotter," and the stars astern will seem to be "cooler."

With the motion of bodies at speeds nearly equal to the speed of light their shape also will be strongly changed: at such speed all bodies will undergo considerable shrinking, or "contraction" on the side in the direction of motion. Consequently, in telescopic observations from a photon rocket the shape of celestial bodies will appear to be markedly disfigured.

It is most essential that all these effects of the theory of relativity be taken into account, because if they are not the virtual

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may be taken for the real, and errors may be committed in astronavigation.

Question: Was the further development of Soviet astronomical technology discussed at the session?

Answer: Yes, it was discussed. The report of Corresponding Member of the Academy of Sciences USSR D. D. Maksutov on the creation in the USSR of the world's largest, 6-meter reflecting telescope according to the decision of the Soviet Government evoked extreme interest.

Some of the technical characteristics of this unique optical instrument were described at the session. Thus, for example, with a diameter of the main mirror of 6 meters it must be one meter thick, and will weigh 65 tons! The over-all weight of the entire installation will be 400 tons. With such grandiose dimensions extremely great precision of assembly is required: the deviation of the parabolic surface of the mirror must be kept within one-twentieth of a micron. ("On the Agenda -- Space!" by F. Yu. Zigel', Nedel' supplement to Izvestiya, 17-23 April 1960, p 14) ✓

Satellite Tracking

The possibility of using long-focus cameras with low-power lens for photographing sputniks is considered. Two methods for increasing the limiting stellar magnitude, by the application of special plate holders with a moving plate, are described. In the first method a cam of special form, rotated by a synchronous motor, is used for moving the plate and the moments of time are recorded by means of a chronograph. In the second method, sinusoidal oscillations produced by a special electromagnet are used and the moments of time are recorded by an electronic oscillograph. Photographs obtained by both methods are reproduced. Estimates of the precision of the methods are given.

("The Utilization of Long-Focus Cameras for the Determination of the Coordinates of Faint Artificial Satellites," by M. K. Abele, Astronomic Observatory of the Latvian State University; Moscow, Astronomicheskii Zhurnal, Vol 36, No 1, Jan/Feb 1960, pp 140-145)

III. UPPER ATMOSPHERE

Color Contrasts on the Lunar Surface in the Visible Spectrum

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The question of the existence or nonexistence of notable differences in the color of individual portions of the surface of the Moon has been the subject of almost a half-century of discussion among astronomers. The results of colorimetric investigations of the Moon conducted by various methods, ranging from color photography

to spectrophotometry, have been of a contradictory character. Some investigators arrived at the conclusion that the Moon is almost completely monochromatic, and others emphasized that the difference in coloring of individual regions of the Moon is quite large.

Discussion of the question of the amount of color differences on the surface of the Moon is by no means of an academic nature. The existence or nonexistence of marked color shadings on the Moon must be connected with peculiarities of the structure of its external covering. Data on the color properties of details of the lunar surface cannot fail to be taken into consideration in attempts to explain the structure and composition of the external layer of the lunar crust.

Without dwelling in detail on the basic works devoted to study of the color of the lunar surface we introduce a brief summary of the results obtained by the authors of these studies in Table 1.

Because the various authors evaluated color properties of lunar objects in different units we have attempted, although approximately, to translate these units into normal color indexes to facilitate comparison of their results. In Table 1 the value ΔCI is the greatest difference in color indexes of details of the Moon obtained by each author.

Table 1

<u>Method, Author, Year</u>	<u>Number of Objects Studied</u>	<u>ΔCI</u>
(a) Visual colorimetry		
V. G. Fesenkov, 1928	8	0. ^m 14
L. N. Radlova, 1941	35	0. 21
(b) Visual spectrophotometry		
Vil'zing Sheyner, 1908-1910 processed by V. V. Sharonov	8	0.44
(c) Photographic colorimetry		
G. A. Tikhov, 1923	9	0.40
N. P. Barabashov, 1924	46	1.25
Kinen, 1931	48	--
L. N. Radlova, 1943	99	0.67
N. P. Barabashov and A. T. Chekirda, 1954	72	0.23
(d) Electrocolorimetry		
A. V. Markov, 1946-1948	10	1.0
(e) Photographic spectrophotometry		
V. I. Yezerkiy and V. A. Fedorets, 1955	5	--
Vigru, 1955	8	0.08

As may be seen from the table, the major portion of investigations have been conducted using the method of photographic photometry, with color filters. The most complete characteristic of the color of the object is provided by the curve of the change of its absolute or relative brightness along the spectrum. However, despite its relative simplicity, practically no spectrophotometric investigations have been conducted of the Moon. Actually, up to 1956 only three works had been devoted to the spectrophotometry of no more than eight details of the lunar surface.

Since 1956 the present author has been conducting systematic spectrophotometric observations of the Moon at the observatory of the Sector of Astrobotany of the Academy of Sciences, Kazakh SSR. Photographs of the spectra of part of the lunar surface are made with a mirror-lens 200-mm type AZT-7 telescope utilizing the system of D. D. Maksutov, and equipped with a single-prism slit-type ASP-9 spectrograph with a dispersion of 143 \AA/mm for $H\gamma$. At the present time sufficiently extensive material has been accumulated to enable decisions to be made concerning the color and spectral properties of various lunar formations.

The basic program of spectrophotometric observations of the Moon was conducted according to the procedure described in Teyfel', V. G.: Astronomicheskii zhurnal [Journal of Astronomy], Vol 36, No 1, 1959, page 114, and Teyfel', V. G.: Trudy Sektora astrobotaniki [Works of the Sector of Astrobotany], No 7, 1959. The spectra of extensive regions of the Moon were taken with the high slit of the spectrograph. The part of the Moon in the Sea of Vapors, with selenographic coordinates $\varphi = +13^{\circ}.0$, $\lambda = +5^{\circ}.0$, was selected as a bearing object for spectrophotometric binding. The positions of the spectrograph slit for projection of the investigated regions of the Moon are shown in Figure 1.

The spectral curves constructed within the wave length interval of 390 to 620 $m\mu$ in relation to the spectrum of the bearing section most precisely characterizes the differences in the spectral reflecting possibilities of lunar formations in the visible range of the spectrum. In all, a complex of 90 portions of the Moon were investigated through 610 spectrograms, for each of which the spectral curve was derived as the average of the results of measurement of 6 to 8 spectrograms. Several of these curves are shown in Figure 2, which conform to the portions of the lunar surface most different in color.

From a simple survey of the spectral curves we may conclude that the variance between the spectral properties of lunar objects is very small. The shape of the spectral curves is very flat, and the small excrescences in most of them lie within the limits of errors in measurement. No special anomalies in the spectra of lunar details were noticed. As is shown by the spectral curves, only the Sea of Hopes (areas G and H) and a few other portions of the Moon have a marked reduction in brightness in the ultraviolet waves.

The even, monotonous shape of the spectral curves of lunar objects enables complete justification for their use as a quantitative expression of color differences on the lunar surface with values of relative spectrophotometric gradient and color indexes.

The relative spectrophotometric gradient is expressed in the following form:

$$(1) \quad G = - \frac{d \ln \frac{I_1(\lambda)}{I_0(\lambda)}}{d(\frac{1}{\lambda})} = -2.30 \frac{d \lg \frac{I_1(\lambda)}{I_0(\lambda)}}{d(\frac{1}{\lambda})}$$

where $I_1(\lambda)$ is the distribution of energy in the spectrum of the investigated object, $I_0(\lambda)$ is the same value for the comparison object. In processing the spectrogram we obtain the value

$$(2) \quad \lg I'(\lambda) = \lg \frac{I_1(\lambda)}{I_0(\lambda)}$$

or, if possible, avoiding the differences in relative brightness of the objects, we obtain only the characteristic of the color difference of the objects

$$(3) \quad \lg I(\lambda) = \lg \frac{I_1(\lambda)}{I_0(\lambda)} - \lg \frac{I_1(\lambda_0)}{I_0(\lambda_0)}$$

where $\lambda_0 = 500 \text{ m}$ and for all objects $I(\lambda_0) = 1$.

Reddish (relatively basic) objects are characterized by a positive value of the gradient G , and yellowish objects have a negative gradient. The gradient G was computed for the entire interval

$\lambda \lambda 390-620 \text{ m}\mu$. However, not all the spectral curves obtained give a rectilinear ratio $\lg I(\lambda^{-1})$ for the entire interval $\lambda \lambda$ indicated. Therefore it appeared advisable to compute the gradients in half-intervals: $G_1(390-500 \text{ m}\mu)$ and $G_2(510-620 \text{ m}\mu)$, which better represent the spectral curve.

The limits within which the relative spectrophotometric gradients of lunar objects are included were obtained through the following:

G : from -0.06 to +0.41

G_1 : from -0.8 to +0.49

G_2 : from -0.20 to +0.52

If the various gradients are converted into units of spectral classification, taking advantage of the corresponding relationships,

then it is seen that the greatest spectral differences of lunar formations do not exceed six units of the spectral class dG . The seas of the Moon are characterized by the smallest average magnitude of gradient G , and the largest is possessed by the bright lunar craters. The continents are distinguished from the seas by a substantially large gradient in the yellow portion of the spectrum, while their gradients almost coincide in the blue portion. Although $G_1 > G_2$ for both seas and craters, in continents, and in the rays and radiant aureoles of craters $G_1 < G_2$.

The fact that $G_1 \neq G_2$ in many details of the lunar surface is not remarkable because even in radiant objects, the radiance of which within a definite interval of wave length conforms to Planck's law, the gradients in the neighboring intervals on the order of 1,000 Å do not necessarily coincide. If the spectral reflecting properties of lunar objects are distinguished to a considerable degree by a distribution of energy in the spectrum from the properties of radiant bodies with a corresponding color temperature, it may be expected that the probability of coincidence of G_1 and G_2 cannot significantly exceed the probability of other relationships between G_1 and G_2 . In actuality the magnitudes G_1 and G_2 of 50 percent of the investigated objects practically coincided, and the distribution of values of the measured degree of difference of G_1 and G_2 is represented very well by the Gauss curve, i.e., the normal law of distribution of chance values is upheld. It is still unknown whether differences of gradients in the half-intervals appear as a result of errors in measurement or whether they are real properties of lunar details. These differences are not great and in any case they do not change the basic results of our investigations.

The simplest characteristic of the color properties of celestial objects is the color index (CI). The difference in color properties of two objects may be expressed by the color excess

$$(4) \quad CE = CI - CI_0 = -2.5 \left[\lg \frac{I(\lambda_1)}{I(\lambda_2)} - \lg \frac{I_0(\lambda_1)}{I_0(\lambda_2)} \right]$$

For normal color indexes $\lambda_1 = 440 \text{ m}\mu$, and $\lambda_2 = 550 \text{ m}\mu$. Application of the color index to reflecting surfaces is not always foolproof because, as indicated by N. P. Barabashov, a single value of color index may correspond to two completely different spectral curves if these curves do not have a monotonous shape of intensity along the spectrum.

The spectral curves of lunar objects indicate that application of the color index (color excess) for characterization of color differences on the lunar surface is equitable. Actually, the relationship between the values of G and CE for lunar details obtained by observation are, within the limits of chance deviations, identical and are represented by a rectilinear relationship.

$$(5) \quad G = 2.27 \text{ CE}$$

From determination of the relative spectrophotometric gradient (1) the theoretical relationship between G and CE may be derived. In this, the factor $d(\frac{1}{\lambda})$ is replaced in (1) by the equation

$$\lambda_1^{-1} - \lambda_2^{-1} = 0.46 \mu^{-1}$$

corresponding to the wave lengths 440 and 550 mμ. Thus

$$(6) \quad G = 0.92 \frac{(m - m_0)_{440} - (m - m_0)_{550}}{0.46}$$

or

$$(7) \quad G = 2.00 \text{ CE}$$

i.e., the theoretical function and that obtained from observations are practically identical.

The use of the color index considerably facilitates massive investigation of the color properties of numerous details of the lunar surface. Measuring transverse dispersion in wave lengths between 440 and 550 mμ of lunar regions with the aid of an MF-4 registering microphotometer, we obtained photometric profiles in monochromatic rays for all the investigated areas of the Moon. Up to 25 individual sections could be isolated in each area, for which the color index was determined as the average of the measurements of 10 to 14 spectrograms. On the basis of these measurements a catalog of the color characteristics of 262 portions of the Moon. The magnitude of color contrasts on the lunar surface may be judged according to the data of the catalog. Inasmuch as the investigated areas conform to morphologically different regions of the Moon, the color difference values obtained may be considered the upper limit of color contrasts for the visible side of the Moon.

The color indexes of lunar details vary from +0^m.76 to +0^m.97, i.e., the limiting color difference is 0^m.21, in normal color index units. Let us pause here for a moment and consider the quantitative distribution of lunar objects according to color. A survey of this distribution presents first of all an interest from the point of view of the development of the most frequently encountered color shadings on the surface of the Moon, and also in respect to comparison of our results with those of earlier investigations.

Let us establish a statistical series for all the investigated objects according to their color excess (Table 2). The curve of distribution is not a Gauss curve, which indicates that the distribution of lunar objects according to color is not random in character. The

maximum number of objects is within the interval $CE = 0^{m}.05$ to $0^{m}.06$ ($CI = 0^{m}.82$ to $0^{m}.83$). The average color index of the Moon for all objects is

$$\overline{CI}_s = +0^{m}.85$$

Table 2

<u>CE</u>	<u>n</u>	<u>p</u>	<u>CE</u>	<u>n</u>	<u>p</u>
-0. ^m 01-0. ^m 00	13	0.050	0. ^m 11-0. ^m 12	19	0.073
0. 01-0. 02	22	0.085	0. 13-0 .14	20	0.077
0. 03-0. 04	34	0.131	0. 15-0 .16	11	0.042
0. 05-0. 06	53	0.202	0. 17-0 .18	15	0.058
0. 07-0. 08	37	0.142	0. 19-0 .20	4	0.015
0. 09-0. 10	32	0.123			

Because the distribution of all objects depends upon the "selection effect," inasmuch as the number of details located in the seas is greater than those located on the continents, let us examine a separate distribution of objects according to color, pertaining to two basic morphological groups: the sea- and continent-areas of the Moon (Table 3).

Table 3

<u>CE</u>	<u>n</u>	<u>Seas</u>	<u>p</u>	<u>Continents</u>	
				<u>n</u>	<u>p</u>
-0. ^m 01-0. ^m 00	11	0.076	--	--	--
0. 01-0. 02	17	0.117	3	0.040	
0. 03-0. 04	28	0.193	2	0.027	
0. 05-0. 06	29	0.200	17	0.230	
0. 07-0. 08	14	0.097	14	0.189	
0. 09-0. 10	15	0.103	7	0.095	
0. 11-0. 12	5	0.034	5	0.068	

<u>CE</u>	<u>Seas</u>		<u>Continents</u>	
	<u>n</u>	<u>p</u>	<u>n</u>	<u>p</u>
0. ^m 13-0. ^m 14	6	0.041	9	0.122
0. 15-0. 16	1	0.007	8	0.108
0. 17-0. 18	1	0.007	7	0.095
0. 19-0. 20	--	--	2	0.027

The maximum number of objects for the seas are in the color excess interval 0.^m03 to 0.^m06, i.e., the greatest number of portions of the lunar seas have the color index of CI = 0.^m80 to 0.^m83. For the continents the curve of distribution has two maximums: at CI = 0.^m82-0.^m83, and at CI = 0.^m90-0.^m91. Figure 3 shows a histogram of the distribution of objects according to color, constructed on the basis of the values of the distribution function

$$f(x) = \frac{p}{l_x}$$

where p is the statistical frequency ($p = \frac{n_1}{\sum n_1}$), and l_x is the magnitude of the CE interval.

The presence of two distribution maximums for the continents is of considerable interest, because if this distribution is actual this means that the substance from which the external covering of the continent areas consist is not uniform. However, we refrain from making any final conclusion on this ground, taking into consideration the fact that the available data is inadequate for making such a conclusion. Additional spectrophotometric investigation of a still greater number (up to 1,000) of sections of the Moon is necessary. These investigations are being carried out at the present time. However, only the following notations may be made:

1. The coloration of the seas and continents generally are identical in range, but the shapes of their distribution curves are different. The distribution curves of the continents drops off on the side of the lesser values of CE considerably more steeply than do the curves of the seas.

2. The main maximum distributions according to color practically coincide for seas and continents, i.e., the greatest number of objects in the seas and on the continents have the values CI = 0.^m82 to 0.^m83. However, the maximums of the continents are sharper than those of the seas.

3. The sloping drop of the distribution curve toward the larger values of CE for all objects (asymmetry of the curve) is connected with the presence of the second maximum in the curve of

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distribution for the continents (or at least the sloping drop of the curve for continents, if the second maximum is not real).

Let us compare the distribution of lunar objects according to color obtained by us, with the distribution obtained on the basis of the data of N. P. Barabashov and A. T. Chekirda. Comparison may be made only for the total number of objects because of the fewer number of objects contained in the work of the latter two authors. The statistical series according to the data of N. P. Barabashov and A. T. Chekirda is contained in Table 4.

Table 4

<u>CE</u>	<u>n</u>	<u>p</u>	<u>CE</u>	<u>n</u>	<u>p</u>
0. ^m 01-0. ^m 02	9	0.130	0. ^m 13-0. ^m 14	5	0.072
0. 03-0. 04	10	0.145	0. 15-0. 16	3	0.044
0. 05-0. 06	11	0.160	0. 17-0. 18	2	0.029
0. 07-0. 08	13	0.188	0. 19-0. 20	4	0.058
0. 09-0. 10	10	0.145	0. 21-0. 22	0	0.000
0. 11-0. 12	0	0.000	0. 23-0. 24	2	0.029

The structure of the distribution curve is not very distinct, but its asymmetry is noticeable clearly enough and has the same character as the curve of distribution according to our observations. The maximum number of objects have the value $CE = 0^m.05$ to $0^m.08$, i.e., if several differences in the zero-point are taken into consideration they practically coincide with the values obtained by us.

An asymmetric distribution curve also is obtained from the data of the catalog of L. N. Radlova. Thus independent observations of various authors lead to the single result, disclosing the predominance on the lunar surface of more colorful objects conforming to the steeper slope of drop of the distribution curve on the side of the large values of the color index. ("Color Contrasts on the Lunar Surface in the Visible Spectrum," by V. G. Teyfel', Vestnik Akademii Nauk Kazakhskoy SSR, No 2(179), 1960, pp 77-84)

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Radio Image of the Moon

The distribution of radiobrightness of the Moon in 8 mm band was measured with the 22 m radiotelescope of the Physics Institute imeni P. N. Lebedev. It is connected with the phase and is shifted about 30°. The limb darkening is revealed too. ("The Radio Image

of the Moon in 8 mm Band," by N. A. Amenitskiy, R. I. Noskova and A. Ye. Salomonovich, Physics Institute imeni Lebedev, Academy of Sciences USSR; Moscow, Astronomicheskii Zhurnal, Vol 36, No 1, Jan/Feb 1960, pp 185-186) ,

New Type of Grating

An attempt to apply an echelle-grating for the spectroscopy of solar flares and other nonstationary processes on the Sun with the aid of the tower solar telescope is described. The echelle was made by F. M. Gerasimov and permits the whole solar spectrum on the range $\lambda\lambda$ 3700-6600 Å to be obtained in the form of separate strips covering a 13 x 18 cm plate. The dispersion is ≈ 1 Å/mm, the resolving power ≈ 0.04 Å and the exposure 0.5 sec. Examples of the obtained spectra of the Sun and solar flares are given. The use of the echelle permits the detection of a large number of emission lines in flare spectra. The hydrogen lines in separate cases can be traced to H₂₂, about 12 lines of He (including λ 4686 HeII) are well pronounced and more than 450 metallic and other lines can be identified in flare spectra.

A catalog is given of emission lines in the spectrum of the flare of 17 August 1959 obtained with the echelle-grating. ("The Spectroscopy of Solar Flares With an Echelle Grating," by A. B. Severny, N. V. Stechenko and V. L. Khokhlova, Crimean Astrophysical Observatory, Academy of Sciences USSR; Moscow, Astronomicheskii Zhurnal, Vol 36, No 1, Jan/Feb 1960, pp 23-31)

Atmospheric Ionization of F2 Layer

The variation of the ionization component of the F2 layer during the first-half of the day are investigated. It is shown that the variation of the diurnal illuminated component during the year correlates well with the sine of the zenith angle of the Sun. The annual amplitudes of the diurnal illuminated component are well defined by the mean annual values of sunspot numbers. At the latitude of Tomsk the ionization in the F2 layer is saturated during the summer months.

The introduction of the parameter $f^{\circ}F2 \sim$ of ionization of the F2 layer permits a sufficiently accurate prediction of the state of ionization for a long period. ("The Variation of Ionization of the F2 Layer During the First Half Day," by A. I. Likhachev, Siberian Physico-Technical Institute at the Tomsk State University imeni Kuybyshev; Moscow, Astronomicheskii Zhurnal, Vol 36, No 1, Jan/Feb 1960, pp 135-139)

Observations of Solar Supercorona

The summarized results of observations of the solar supercorona made at the Crimean station of the Physics Institute of the Academy of

Sciences USSR are given. These observations were made on different wavelengths and interference bases of different dimensions during 1951-1958. The mean characteristics of the supercorona at the minimum phase of solar activity are found. During the period of maximum solar activity the electron concentration of non-uniformities increases in the mean by a factor of 2. An increase of the electron concentration is observed for the outer as well as the inner regions of the supercorona. The mean minimum velocity of the plasma ejected from the Sun during the period of maximum solar activity and reaching the outer regions of the supercorona is 1 km/sec. ("The Solar Supercorona from Observations of 1951-1958," by V. V. Vitkevich, Physics Institute imeni Lebedev, Academy of Sciences USSR; Moscow, *Astronomicheskii Zhurnal*, Vol 36, No 1, Jan/Feb 1960, pp 32-41)

Observation of Radio Echo of Meteors Using Two Receivers

The results of the study of the parameter S of the function of distribution of meteoric bodies with mass are given for the Quadrantid stream of 1949. It is shown that S did not remain constant but varied with time and reached its maximum value 2.96 at about 0500-0700 hours UT on 4 January 1959. The deduction is given of the formula for the determination of the diffusion coefficient D from radio echo observations of meteors with two receivers of different sensitivity. ("Radio Echo Observations of Meteors with Two Receivers of Different Sensitivity," by L. A. Katasev, V. N. Korpusov, and A. D. Orlanskiy, Institute of Applied Geophysics, Academy of Sciences USSR; Moscow, *Astronomicheskii Zhurnal*, Vol 36, No 1, Jan/Feb 1960, pp 115-118)

Structure of Quadrantid Meteors

The results of the measurements of the number and duration of meteor radio echoes made in January 1959 in Kharkov were used for studying the structure of meteor streams. The distribution of meteors according to duration shows that in the central condensation of the Quadrantid stream there is a concentration of the largest particles. The maximum of the number of particles encountering the Earth is later in time, the larger the particles considered. The distribution of meteoric bodies with mass shows that apparently there is a lower limit in the mass of the particles held by the stream. An identical character of distribution is observed for the meteoric particles of the Geminid stream. ("The Structure of the Quadrantid Meteor Stream," by B. L. Kashcheyev and V. N. Lebedinets, Kharkov Polytechnical Institute imeni Lenin; Moscow, *Astronomicheskii Zhurnal*, Vol 36, No 1, Jan/Feb 1960, pp 119-122)

Infrared Spectrum of the Night Sky Studied

The emission spectrum of the night sky in a wide region, $1.2-3.4 \mu$, was obtained by means of a spectrophotometer with a lead sulphide photoresistor. The results for the region $1.2-2.0 \mu$ are in good agreement with the data of Gush, Johns and Harrison (J. of Atmospheric and Terrestrial Physics, 7, 185, 1955; 11, 192, 1957). The region $\lambda > 2.0 \mu$ was investigated for the first time. In the region $2.1-2.5 \mu$, which is relatively free of tropospheric absorption lines, no intense emission was detected. The weak maximum at $2.1-2.2 \mu$ was identified with the band, 9-7 OH 2.145μ . In the $2.6-3.4 \mu$ region the spectrum of thermal emission of the troposphere was recorded. At 2.3μ there is a sharply defined band structure which is identified with the reversed absorption spectrum due to tropospheric vapors of H_2O . The absolute intensities of the 8-5, 3-1, 4-2, 5-3, 9-7 OH bands were found and compared with theoretical values. The intensity ratios of bands with common upper levels derived using data of other authors also, are in better agreement with the Einstein coefficients calculated by Shklovskiy than with the second approximation of Heaps and Heizberg. The intensities of the bands which were not studied (3-2, 4-3, 5-4, 9-8) are calculated and the possibility of investigating the bands at $\Delta V = 1$ discussed. ("The Infrared Spectrum of the Night Sky up to 3.4μ ," by V. I. Moroz, State Astronomical Institute imeni Shrenberg; Moscow, *Astronomicheskii Zhurnal*, Vol 36, No 1, Jan/Feb 1960, pp 123-130)

Determination of the Balmer Decrement in the Spectrum of the Aurora Polaris

The hydrogen lines H_α , H_β , H_γ (dispersion 250 \AA/mm) were photographed in three aurorae polaris. The average decrements obtained for $H_\alpha:H_\beta:H_\gamma$ were 3.0:1.0:0.8.

At the Roshchino station the hydrogen lines H_α , H_β and H_γ were obtained for a single spectrum in three cases, using a simple homemade spectrograph with low dispersion ($\sim 250 \text{ \AA/mm}$), with exposures of 3 to 5 hours. The spectral sensitivity of the instrument and film were calculated with the aid of a calibrated luminophor. The decrement values obtained are shown in the accompanying table.

Value of the Balmer Decrement $H_\alpha:H_\beta:H_\gamma$ in the Aurora Polaris

<u>Spectrum</u>	<u>$1_{H_\alpha} : 1_{H_\beta} : 1_{H_\gamma}$</u>
2-3 Dec 1958, 13-14 Dec 1958	3.0:1.0:0.7
First half of night 13-14 Dec 1958	3.2:1.0:0.8

<u>Spectrum</u>	<u>$1H_{\alpha} : 1H_{\beta} : 1H_{\gamma}$</u>
Second half of night, according to observations of Yu. I. Gal'perin	2.8:1.0:0.9
At Loparskaya	1:0:0.8
Computed values of Chamberlain	3.34:1.00:0.33

The aurorae of 2-3 December 1958 and 13-14 December 1958 differed in type. The first was a greenish-white 3-4 mark with development of shape from arch to ray, transforming to drape and ending with flame forms. Its spectrum contained intense molecular bands. The second aurora was a diffuse light without development of shape, which lighted a large portion of the sky. The atomic lines were markedly strong in the spectrum. It must be noted that during this aurora movement of the region of hydrogen emission toward the north was observed. During the first half of the night the hydrogen emission was strong at Roshchino and weak at Loparskaya, and during the second half of the night, from 0200 to 0600 hours, it strengthened markedly at Loparskaya and weakened at Roshchino. This occurred simultaneously with slight equalization of the intensity of Balmer lines, which may be seen in the table (lines 3 and 4).

On the whole, the decrement values of both aurorae were very similar. The measured value for the ratio $1H_{\beta} : 1H_{\gamma}$ is close to the value obtained at Loparskaya [G. I. Galperin, Planet, Space Sci., Vol 1, No 57, 1959]. The general trend of the decrement differs from the computation of Chamberlain [J. W. Chamberlain, Astrophys. J., 120, 360, 1954]. This may be caused by a decreased initial speed of the protons. ("Determination of the Balmer Decrement in the Spectrum of the Aurora Polaris," F. K. Shuyskaya; Moscow, Astronomicheskii Zhurnal, Vol 37, No 1, pp 186-187)

Figure Appendix for Chapter III Upper Atmosphere

CPYRGHT



Figure 1.

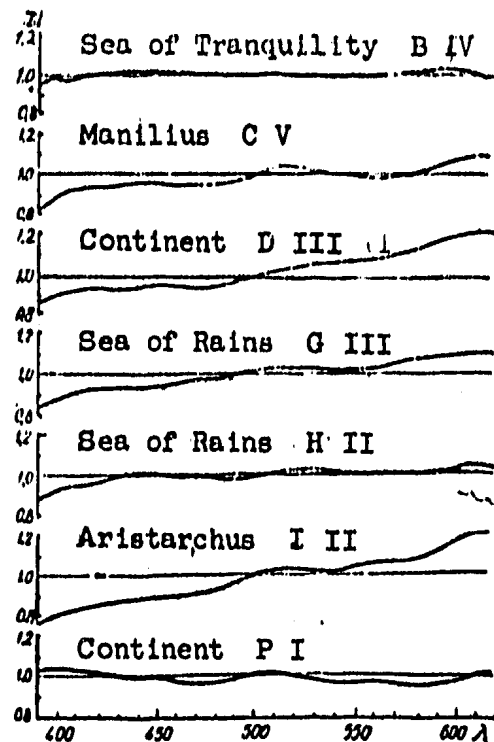


Figure 2

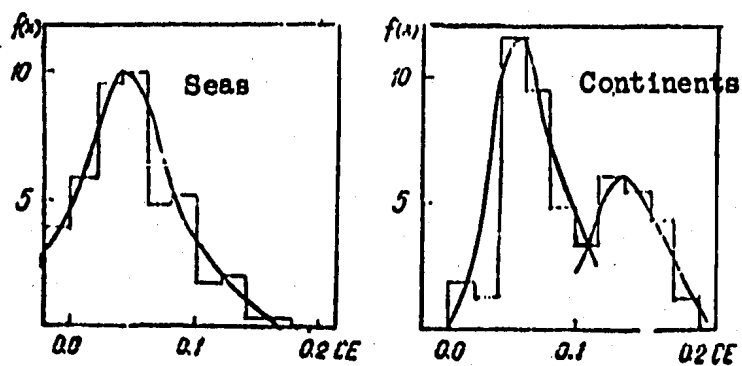


Figure 3

IV. OCEANOGRAPHY

Oceans -- The Storehouse of Mankind

The ocean contains great resources of plant and animal raw material, unknown mineral riches and colossal power reserves. The surface of the ocean, its depths and the air space above it constitute the cheapest and shortest routes of travel. There is an interchange of moisture, heat and carbon dioxide gas between the ocean and the atmosphere. All this long has attracted the steady attention of man. Interest in the seas and oceans is developing rapidly, at an ever increasing rate.

It attracts investigators to the ocean bottom and to the secrets hidden on and below the bottom. If this is not a remarkable example of human love of knowledge and courage, then we have the dive made not long ago by J. Picard to the greatest depth, nearly 11 kilometers, in the Mariana Trench. Possibly the day is not far off when man will be a regular visitor there.

Many branches of science are interested in this entry into the ocean depths, including geology, geophysics, geography, biology and geochemistry.

On the bottom lie kilometers-thick benthic deposits, accumulated during the entire history of the ocean. All the facts of this history are printed in the deposits as though in a great yearbook, still unread, and promising solution of many important problems.

Has the climate of the earth changed during the past billions of years of its history, or has it ever been thus? Have there been periods of uniformly warm climate on the earth, or have there always been climatic zones? Did the ocean always exist, or did it arise only during the latter periods of the life of our planet?

Did the positions of the Earth's poles and of the Earth's axis change, or have they always remained approximately in the same position where they are now? Are the sunken continents of Atlantis, Gondwan, and the Pacific hidden in the ocean depths? Do continents move thousands of kilometers in a horizontal direction or do they always remain in exactly the same place? What is the structure of the Earth's crust and its underlying layer, the mantle, which is molten?

There are serious reasons for believing that the ocean bottom may give the answers to all these questions.

Some initial data already are known. Application of the methods of systematic sounding and gravimetry have shown that the earth crust under the oceans is very thin. In the continents it is 30 to 40 kilometers thick, and below the oceans it is 5 to 8 kilometers thick.

Several years ago US engineers worked out a plan for drilling through the entire thickness of deposit and through the earth's crust to the secret, molten magma. The plan, which is to be carried out

within the next four years, provides for drilling from a large ship. Equipped with a special drilling derrick, this ship must be secured by thick cables between several anchors, placed at depths of 4 to 5 kilometers.

However, drilling from a ship through 4 or 5 kilometers of deposit is hardly a working method for penetrating the earth's crust. This plan is too complicated technically, and storms and gales hardly will allow the possibility for its use in the future, even though positive results may be achieved one time.

It is very clear that the technical concept for mastering the ocean bottom runs along the lines of designing automatic drilling equipment which may be lowered to the bottom of the ocean and may be controlled from automatic, self-propelled bathyscopes.

One thing is clear: man very quickly will become master of the ocean floor, of its secrets and its resources.

Oceans cover three-fourths of the Earth's surface. To the present time man has obtained all his mineral resources from one-fourth of the earth's crust. May we think that three-fourths of the earth's crust, covered by water, is bare of mineral deposits? No, we cannot. When man has conquered the ocean bottom it is possible that prospecting and working out minerals there will be easier than on dry land.

The crux of the matter is that the major mineral deposits are located in a zone of transition from the hard crust to the subcortical mantle, in the so-called "lines of Mokhorovichich," named in honor of the Yugoslav geophysicist who established this formation through seismic methods based upon sharp differences in the speed of propagation of sound through the crust and the distribution of the deeper, molten magma (mantle). However, much still remains completely unclear in the understanding of the structure of the earth's crust and of the subcortical layer.

The mineral riches of the ocean may be searched on the very surface of the bottom. For a long time it has been known that so-called "ferromanganese concretions" may be found there. Large quantities of these concretions cover the bottom of the White, Baltic and Caspian Seas. Photographs of the bottom of the Atlantic and Pacific Oceans show that wide expanses also are almost completely covered with these concretions.

Their quantity sometimes reaches many tens of kilograms per square meter. In the Pacific Ocean alone the area covered by concretions consists of several tens of millions of square kilometers, and their total weight is several billion tons!

The origin of these concretions is tied to the vital activity of special types of bacteria which are able to concentrate minerals which are dissolved in insignificantly small amounts in sea water. In addition to iron and manganese, the concretions also contain nickel, cobalt and copper.

Does man have the right to allow this really great quantity of valuable ores to lie waste, covering the floors of the oceans and seas? No, he does not! It may be stated with confidence that the coming century will be the century of the conquest and mastery of space, but also of the earth crust beneath the oceans. ("Oceans -- The Storehouse of Mankind," by L. A. Zenkevich, Corresponding Member of the Academy of Sciences USSR, and President of the Oceanographic Committee, Nedel', Sunday supplement to Izvestiya, 10-16 April 1960, p 2)

On the Expanses of the Indian Ocean CPYRGHT

Yesterday the expeditionary ship of the Academy of Sciences USSR "Vityaz'" [Knight Errant] arrived in the port of Odessa. We left our native shore at Vladivostok almost seven months ago. For half a year the "Vityaz'" plowed the expanses of the Indian Ocean. Oceanographic sections with small chains of installation-stations, at each of which various types of investigations were conducted, cut across the ocean in meridional and latitudinal directions from the shores of the Asiatic continent to the boundaries of the south polar waters, from Australia to Ceylon and India, and from India west to Madagascar and the shores of Africa. The distance covered was approximately 30,000 miles. Unique collections were gathered. The materials of 247 oceanographic stations enable multilateral and renewed illumination of the nature of one of the greatest oceans of the world.

It seems paradoxical that the Indian Ocean, which is crossed by hundreds of ships every year, until recently remained one of the least studied oceans of the world. Only at present are many of its "secrets" being revealed.

The investigations of the "Vityaz'" covered the enormous expanse of water between three continents: Australia, Asia and Africa. These investigations were conducted according to the International Geophysical Cooperation program. New data on the relief of the ocean were obtained, new deep currents were discovered, and approximately 100 previously unknown types of mammals and fishes were discovered.

In many of the areas studied, which appear on the maps as deep blue spots indicating great depths, we discovered extensive elevations and individual mountains. The current is so strong near the bottom that with even slight elevation in the relief the silt is carried away. In these places we found great accumulations of the remains of extinct animals, particularly teeth of ancient sharks, slightly interstratified with small amounts of sediment.

Three Indian scientists participated in the study of the western portion of the ocean: Doctor Reguye Prasad, the famous marine biologist, member of the UNESCO committee on marine research, hydrologist Ayer, and Master of Science Irama Radzhu.

In the western portion of the Indian Ocean we crossed the Equator six times. Here, close to the shores of Africa, is an area of an enormous number of small islands. They are the remnants of the ancient continent of Lemuria, which was lost under the waters of the ocean. In tests of the bottom, conducted at depths of almost five kilometers, sand was found under a two-meter layer of ordinary oceanic silt. Apparently this also is a trace of ancient Lemuria. The isles are surrounded by coral reefs, and atolls often rise several meters above the water. Corals are the principal accumulators of lime. Gigantic colonies of these small organisms have been conducting their constructive work for hundreds of millions of years.

The system of winds and currents in this region, the presence of submarine mountains and the island archipelagoes create conditions particularly favorable for the development of life. Great shoals of tunny and other fish feed in the great oceanic pastures. It is interesting that the fishing in areas far from shore is in the hands of Japanese enterprises. At night we frequently were forced to reduce speed to avoid Japanese fishing stages.

The final stage of work was devoted to the Bay of Aden and the Arabian Sea. The causes of the phenomenon frequently observed at the Arabian shores, consisting of mass death of fish as a result of "starvation," and which is brought about by water from the ocean depth poor in oxygen coming to the surface, were carefully studied.

It is simply impossible to discuss in the present article, albeit briefly, the results of seven months of research, of all the new things which were seen and discovered, and of visits to countries and islands of the Indian Ocean. Nevertheless I do hope to write about several encounters.

During its voyage the "Vityaz'" visited many foreign ports, including Djakarta, Freemantle in western Australia, Colombo in Ceylon, Cochin in southwest India, Bombay, and Tamatave in Madagascar. We were the first Soviets to visit Male, capital of the Maldive island sultanate. During the stay at the island of Nossi-Be, near the northern limit of Madagascar, an entrance to the Bay of the Russians was discovered among the mountains, so named by the French in honor of a squadron of our countrymen which stayed in the bay in 1904 during their trip to the Far East. We were the first Russians to visit these waters in 56 years. The inhabitants of the Comoro Islands (they also are known as Lunians because Comoro means Moon in Arabian), of the island of Zanzibar, the African shore and the Sea Shell Islands saw the USSR flag for the first time when it was flown aboard the "Vityaz'." Everywhere we were overwhelmed by warm welcome.

Unfortunately the concept of the Soviet Union occasionally is confused and unclear.

"Is it possible that these photographic cameras were made in the Soviet Union?" we were asked on Madagascar by the renowned botanist Ton'ye, as he examined our "Kiev" and "Zorkiy" cameras. "But, after all, you do buy your microscopes from Germany."

We replied:

"No, they also are our own."

In the Comoro Islands we were met by Police Lieutenant Merten, who readily pointed out on the map a locality favorable for collecting coral. In conclusion, however, he suddenly and unexpectedly said:

"I am especially pleased to be of service to Russians, because Soviet troops liberated me from Fascist captivity in East Germany."

At each stop hundreds and thousands of people visited the "Vityaz'," and talked with the sailors and with members of the expedition. In Indonesia, Australia, Ceylon and Madagascar our associates gave talks before the local scientists.

The main impression, uniform in all the visited countries, is that the old order, propagated for centuries by the colonizers, is crumbling away. The new is breaking out in life. Where not long ago administrative posts were occupied by Europeans, those posts now are passing into the hands of the national intelligentsia.

Even in Zanzibar, which in the preceding century was the center of slave trade in East Africa and at present is under the protectorate of Great Britain, the growing influence of the national party of the masses is felt. During an excursion in the vicinity of the city of Zanzibar, among plantations of clove trees, cocoa palms and coffee plantations, we became acquainted with an African of the Swahili tribe, the youth Ali, who participated in the World-Wide festival of youths and students at Moscow. He has translated Russian songs and the Hymn of the Democratic Youth into the Swahili language. In speaking with the Africans we frequently heard the word "Nkhuru!" or "Freedom!" spoken instead of the customary greeting.

The common misfortune of all these countries is the insufficiency of their national cadres, their intelligentsia. Because of this at every encounter they questioned us at length about the Universality of the Friendship of Peoples, established at Moscow. News of this recommendation of Nikita Sergeyevich Khrushchev has reached into the farthest places.

Many thousand miles from our home shores it was noted with joy that our Homeland serves as a beacon of hope for millions of people who strive for freedom and progress.

At present the ship "Vityaz'" is under repair. In September it will set out on the return voyage, again through the Indian Ocean. ("On the Expanses of the Indian Ocean," by V. Bogorov, Corresponding Member of the Academy of Sciences USSR, Head of Expedition, aboard the expeditionary ship "Vityaz'" (via radio), Pravda, 29 April 1960, p 6) ✓

Problems of the Caspian Sea

Professor B. A. Apollov, Doctor of Technical Sciences and Caspian Sea specialist, proposes a plan for "terminating the caprices of

the Caspian" and bringing the Caspian, which for thirty years has become catastrophically shallow every year, back to its old shores by building a stone dam, 375 kilometers long, across the Caspian in an east-west direction from a point thirty kilometers below the city of Kaspitsk to the Dolgomo peninsula, creating a 76,000-square-kilometer water reservoir out of the northern portion of the Caspian, which would fill up in two or three years. Other plans for regulating the Caspian Sea include diverting the Pechora and Vychegda rivers to the Kama, and thence through the Volga to the Caspian Sea. This plan, suggested by engineer G. V. Dmitriyev, would require reservoirs to be built at Pechora, Vychegda and Kama, interconnected by canals of an average length of 160 kilometers. An alternate plan involves the use of explosives for building a partitioning dam, but this would kill great quantities of fish. ("Problems of the Caspian Sea," by B. A. Apollov, Nedel' Sunday supplement to Izvestiya, 10-16 April 1960, p 2)

Special Quantitative Characteristic of Deep Sea Life in the Ocean

In an article in Izvestiya Akademii Nauk SSSR, Seriya Geograficheskaya, No 2, 1960, L. A. Zenkevich reviews mostly US authors' views concerning the antiquity and ecology of bottom fauna in freshwater seas and in the oceans, arriving at the conclusion that salt-water bottom fauna must be taken as ancient forms of life, whether similar species or fossils are found in fresh water or on dry land, or not. The author also presents tables and charts showing the bipolar and circum-tropical quantitative distribution of bottom fauna based on Soviet sources. The statement by US marine biologist Thorson that very little work has been done in the field of quantitative mapping of shallow water bottom communities is rebutted by the author, who explains that for the past 35 years the USSR has conducted quantitative investigation of biomasses, the productivity of bacteria, plants and animals, benthos and plankton, especially in the Bering, Azov and Caspian Seas, and that during the past 10 years the "Vityaz'" and "Ob'" expeditions have obtained data on the quantitative distribution of bacteria, plankton and benthos in the deep-water zones of the Pacific and Indian Oceans and in the Antarctic waters. Comparison of data on the quantitative distribution of organisms and their chemical composition with the chemical composition of bottom sediment and its rate of accumulation enables a fairly accurate expression of the accumulation on the bottom and re-solution of many chemical components, particularly CaCO_3 and SiO_2 . ("Special Quantitative Characteristic of Deep Sea Life in the Ocean," by L. A. Zenkevich, Izvestiya Akademii Nauk SSSR, Seriya Geograficheskaya, No 2, 1960, pp 10-16)

Hydrologic Conditions of the Solomon Sea

K. T. Bogdanov relates that on its twenty-fifth cruise the "Vityaz'" took 18 hydrologic stations in the Solomon Sea, including two stations at great depths, the results of which were at a variance with the results found by the "Challenger" in 1872-1876, and that the currents in the Solomon Sea actually are different from those shown on the map of the currents of the Pacific Ocean contained in the Marine Atlas, Volume II. The water circulation determined on the basis of the data of the "Vityaz'" is shown on a map of relative dynamic topography which accompanies the article. Although the "Challenger"'s findings indicated that the depths of the Solomon Sea were isolated from the Pacific currents, the findings of the "Vityaz'" indicate that the southern trade current and deep waters flow into the Solomon Sea, mainly from the southeast, through a deep channel located to the west of the southern tip of the Solomon Islands, through the straits between these islands, and through the Pioneer Straits between New Ireland and the island of Buk. The narrow straits located between New Guinea and New Britain are called the Vityaz Straits. ("Hydrologic Conditions of the Solomon Sea," by K. T. Bogdanov, Izvestiya Akademii Nauk SSSR, Seriya Geograficheskaya, No 2, 1960, pp 117-122)

V. GLACIOLOGY

Contemporary Glaciation of Bazardyuzi

CPYRGHT

The summit of Bazardyuzi (4,480.9 m) is one of the highest mountains of the East Kavkaz range. Protruding somewhat toward the north from the main water divide ridge, this mountain group divides the sources of the rivers Yatukhdere and Sel'dy.

The first information on the glaciers of Bazardyuzi may be found in the works of G. V. Abikh. A. V. Pastukhov spent some time in the region of Bazardyuzi in 1892, and in his work he includes a short description of the glaciation of this part of the Kavkaz. In another work he gives a fairly detailed description of two glacial tongues on the northern slope of Bazardyuzi. In 1938 the glacier expedition of the Azerbaydzhan affiliate of the Academy of Sciences USSR worked on Bazardyuzi and studied traces of ancient glaciation and also the type and dimensions of contemporary glaciers.

In the summer of 1958 an expedition of the Administration of the Hydrometeorological Service of the Azerbaydzhan SSR, headed by I. M. Kisin, investigated the contemporary status of the glaciers of Bazardyuzi.

The glaciation of Bazardyuzi consisted of two glaciers, Tikhi-tsar and Murkar, and a firn cap covering the summit of the mountain, from which five small, pendulous, paddle-shaped tongues emerge.

The glacier Tikhitsar is the most inaccessible. Its length is approximately 0.9 km, and its width is 150 to 200 m. The slope of the glacier varies greatly along its length, averaging approximately 25 degrees.

In individual sections the slope of the glacier increases to 45 degrees or more. The tongue of the glacier, extending toward the north, begins as an ice chute 60 m high with a sharp slope of 60 to 70 degrees at its exit from a squared semicircle, and its surface is broken by steep (3 to 5 m wide) transverse fissures. At a distance of 170 m from the end of the tongue there is a second, steeper (40 to 50 degrees) ice chute approximately 40 m high.

The significant slope of the Tikhitsar glacier causes its intense speed of movement. According to measurements taken during the period of the expedition the speed of movement of the glacier along the line of direction (Table 1) was from 4.4 to 9.3 cm/day. Its greatest speed was noted in the center of its section, with the speed decreasing toward the edges.

The tongue of the glacier ends in an icy hill slope 35 m high, with a slope of 50 degrees, at the sole of which, at an altitude of 3,160 m (absolute altitude), is a grotto. The grotto is 1.2 m high and 4.5 m wide.

Table 1

Observations of the Speed of Movement of the Glacier Tikhitsar

<u>Measuring Rod Number</u>	<u>Distance From Left Bank, m</u>	<u>Displacement of Measuring Rods, cm</u>			
		<u>21-25 June 1958</u>		<u>26-30 June 1958</u>	
		<u>After 5 Days</u>	<u>cm/day</u>	<u>After 5 Days</u>	<u>cm/day</u>
Mark	00	00	00	00	00
1	55	28	5.6	25	5.0
2	95	43	8.6	47	9.3
3	145	22	4.4	26	5.2
Mark	175	00	00	00	00

The recession of the tongue of the glacier Tikhitsar is fairly rapid. Comparing the marks obtained for the end of the tongue by L. N. Leont'yev (3,125 m) in 1938 and by us in 1958 (3,160 m) it is apparent that a difference of 35 m was produced over a period of 20 years. According to the series of oblique indicators and according to questioning of shepherds and hunters who visit this site from time to time, the recession of the tongue of the Tikhitsar glacier over a period of 20 years is approximately 190 to 200 m.

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Glacier Murkar extends in a northeasterly direction, making a circular dilation at the slope of the city of Bazardyuzi. The ring of the glacier has the shape of a bowl with almost vertical walls, and has a diameter at the bottom of 700 to 800 m. On the slopes of the ring narrow hollows, filled with firn, may be observed. The total length of Murkar is 1,440 m, and it is 300 to 450 m wide. The slope of the glacier varies insignificantly along its length, averaging 10 to 15 degrees. The surface of the glacier has an extremely broken character, with individual depressions reaching 5 to 7 m. Near its right bank it is intersected by the long bed of a brook 15 to 18 m deep. Along its entire length the top of the glacier is covered with moraine deposits up to 1 or 1.5 m deep, and the ice is visible only in occasional patches.

The tongue of the glacier ends in a ledge 70 m high, 130 m wide and with a slope of 50 to 60 degrees. At the sole of the ledge is a grotto 0.8 m high and 1.2 m wide. The mark of the grotto was determined at 2,940 m, against 2,920 m entered in 1938 by L. N. Leont'yev. At that time the Murkar glacier descended much lower and, according to the description of K. I. Bogdanovich and L. N. Leont'yev, completely partitioned off the valley, as a result of which the stream flowing out from the Tikhitsar glacier gouged a tunnel in the ice of Murkar. At the present time the confluence of the streams occurs below the end of the tongue of Murkar, and its recession over a period of 20 years (with a fair degree of accuracy) has been 220 m. Thus after a relatively long stationary status (from 1901 to 1938) the recession of the glacier during the past 20 years has been very rapid, averaging 11 m per year.

The Murkar glacier does not have a firn basin, and it is fed mainly by snow avalanches from the slopes, and by crumbling of overhanging firn. At an elevation of 350 to 400 m above the upper end of the glacier selva of the firn cap overhangs the glacier, where the thickness of the ice reaches 20 or 30 m. The force of the ice of Murkar gradually decreases from the end of the tongue of the glacier, where it is 60 to 70 m, to its beginning, where it exceeds 10 or 15 m, compared to 20 to 25 m according to L. N. Leont'yev. This circumstance led to the idea of earlier investigators to the effect that the Murkar glacier is: "...a peculiar type of dead glacier, having lost connection with the feeding basin."

A speed line established in the central portion of Murkar glacier (Table 2) enabled elucidation of the speed of movement of the glacier, varying from 1.2 to 4 cm/day.

The insignificant speed of movement of Murkar Glacier in comparison to that of Tikhitsar glacier is explained both by the considerably gentler slopes of the glacier bed and by poorer conditions of feeding (lack of a firn basin).

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Table 2

Observations of the Speed of Movement of the Glacier Murkar

<u>Measuring Rod Number</u>	<u>Distance From Left Bank, m</u>	<u>Displacement of Measuring Rods, cm</u>			
		<u>20-24 June 1958</u>		<u>25-29 June 1958</u>	
		<u>After 5 Days</u>	<u>cm/day</u>	<u>After 5 Days</u>	<u>cm/day</u>
Mark	00	00	00	00	00
1	40	8	1.6	10	2.0
2	100	14	2.8	16	3.2
3	160	20	4.0	15	3.0
4	240	12	2.4	8	1.6
5	340	6	1.2	7	1.4
Mark	390	00	00	00	00

Studies of the melting of the surfaces of the Tikhitsar and Murkar glaciers also were conducted by means of special ablation-measuring rods mounted at various elevations (Table 3).

Table 3

Melting at Ablation-Measuring Points
of the Tikhitsar and Murkar Glaciers, cm

<u>Date</u>	<u>Tikhitsar</u>			<u>Murkar</u>		
	<u>Rod No 1 3,185 m</u>	<u>Rod No 2 3,220 m</u>	<u>Rod No 3 3,290 m</u>	<u>Rod No 1 3,020 m</u>	<u>Rod No 2 3,090 m</u>	<u>Rod No 3 3,140 m</u>
17 June	6	4	3	2	1	0.5
18 "	7	6	3.5	3	2	0.7
19 "	5	3	2.0	1	0.8	0.5
20 "	3	2.5	1.0	2	2.7	1.0
21 "	covered by snow					
22 "	4	3.5	3.0	2	1	0.8

<u>Date</u>	<u>Tikhitsar</u>			<u>Murkar</u>		
	<u>Rod No 1</u> <u>3,185 m</u>	<u>Rod No 2</u> <u>3,220 m</u>	<u>Rod No 3</u> <u>3,290 m</u>	<u>Rod No 1</u> <u>3,020 m</u>	<u>Rod No 2</u> <u>3,090 m</u>	<u>Rod No 3</u> <u>3,140 m</u>
23 June	3.0	4.5	2.0	3	0.8	1.0
24 "	4.0	2.5	1.6	2.5	1.2	1.0
25 "	6	4.5	3.8	3.0	2.2	1.2
26 "	7	5.4	3.5	3.4	2.0	1.0
27 "	5.4	3.0	2.0	4.0	1.5	1.2
28 "	7.5	6.2	4.1	4.5	2.0	1.4
29 "	6.0	4.3	3.5	3.4	2.5	1.2
30 "	5.5	3.4	2.5	3.0	2.2	1.0

The amount of daily melting varied within considerable limits, comprising from 1 to 7 cm on Tikhitsar, and from 0.5 to 4.5 cm on Murkar. The small amount of melting of the surface of Murkar glacier (although the rods were set up at lower elevations than in the case of Tikhitsar glacier) was caused by its shadiness, by the steepness of the slopes of the semicircle, and by good protection of its surface by the layer of moraine.

The area of glaciation of Bazardyuzi according to the determination of L. N. Leont'yev is 4.6 km^2 , and according to our measurements is 3.62 km^2 . It is risky to take the indicated difference in the amount of glaciation (0.98 km^2) as the quantitative characteristic of the shrinking of glaciers over a given period because it may be the result of an error in the accuracy of measurement. However, this indicates the over-all tendency of reduction of the area of glaciation and emphasizes the regressive character of the evolution of glaciers. The area of the tongue of Tikhitsar glacier is 0.5 km^2 , and that of Murkar glacier is 0.8 km^2 . The remaining area of glaciation belongs to the firn cap covering the summit of Bazardyuzi. ("Contemporary Glaciation of Bazardyuzi," by B. A. Budagov and I. M. Kisin, Doklady Akademii Nauk Azerbaydzhanskoj SSR, Vol 16, No 1, 1960, pp 29-32) ✓ *dittoed*

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VI. ARCTIC AND ANTARCTIC

Scientific Conference on the Meteorology of the Antarctic

From 26 through 28 October 1959 a scientific conference on the problems of the meteorology of the Antarctic was held in the Main Administration of the Hydrometeorological Service of the Council of Ministers USSR. Representatives of many scientific institutions participated in the conference, including representatives of the Central Institute of Prognoses, the Main Geophysical Observatory, the Central Aerological Observatory, the Arctic and Antarctic Scientific-Research Institute, the Main Administration of the North Sea Lane (GUSMP), the Institute of Geography of the Academy of Sciences USSR, the Moscow State University and others, who give more than 30 reports at the conference.

The conference began with a dual report on new discoveries in the Antarctic. V. A. Bugayev and Ye. I. Tolstikov presented a relief map of a considerable portion of East Antarctica, based on aeroleveling data of the Antarctic obtained during flights over the continent. The authors of the report organized and participated in these flights.

Yu. M. Model' and A. V. Nudel'man gave a survey of the latest data on the thickness of the ice cover and the relief of the rock bed in the Antarctic.

Nine reports were devoted to the problem of atmospheric circulation above the Antarctic. G. M. Tauber gave the characteristics of the climatic cyclone in the western portion of the Indian sector of Antarctica. S. P. Khromov presented interesting conclusions based on analysis of synoptical processes observed during a cruise aboard the Diesel-electric ship "Ob'" in antarctic waters during the summer of 1956-1957. Khromov arrived at the conclusion, supported by later materials of other authors, that during the summer period the zonal type of processes prevail, and toward winter the meridional type strengthens sharply. The Antarctic front in the processes of cyclonic activity is thrust upward far from the continent. The sharp cloud boundary and drop in temperature in the immediate vicinity of the continent are not of a frontal nature, but are connected with a change in the spreading surface and the run-off circulation. Khromov noted that the aperiodic changes in temperature of the air above the ocean increase considerably with altitude.

This fact is interesting from the point of view that in previous years many authors, fixing a uniform summer temperature background upon the southern portions of the ocean, arrived at incorrect conclusions concerning the lack of air exchange between the temperate and polar latitudes of the Southern Hemisphere. The fact is that the temperature background of the lower layer of the atmosphere is formed under the influence of the powerful effect of the watery surface of the ocean, the temperature of which changes slowly.

The report of Ye. I. Tolstikov, entitled: "Air masses in the region of Eastern Antarctica" gave the characteristics of four basic types of air masses, which he determined on the basis of analysis of aerological soundings at Mirnyy and within the deep interior of the continent, at Vostok Station. The characteristic temperatures of air masses, according to the data of Vostok Station, are 10 or 15 degrees lower than at Mirnyy (distance 1,400 km).

Voluminous material on the development of synoptic processes above Western Antarctica was generalized in the report of P. D. Astapenko. The report of S. S. Gaygerov was devoted to comparison of circulation of the atmosphere in the Antarctic and Central Antarctic, through the demonstration of many vertical sections, maps, graphs and tables.

The report of G. V. Gruz, entitled: "On the Problem of Investigation of Planetary Circulation With the Aid of the Characteristics of Macroturbulence" evoked great interest. It was shown that the kinetic energy of atmospheric movements in the Southern Hemisphere is twice as great as in the Northern Hemisphere. The energy of meridional movements is approximately the same in both hemispheres. Through comparison of meridional currents of heat it was established that the cooling role of the Antarctic is greater than that of the Arctic with respect to the atmosphere.

A large group of reports referred to the radiation and heat balance, the climatic system and to individual meteorological peculiarities of Antarctica. Among the latter two reports must be mentioned: two reports by N. P. Rusin on "The Radiation Balance of the Snowy Surface of Antarctica" and "Turbulent Heat- and Moisture Exchange in the Layer of Air Near the Surface in Antarctica," and two reports by V. F. Belov on the results of actinometric observations in the Antarctic with the aid of aircraft, and on a meridional radiation profile, obtained during a cruise aboard the Diesel-electric ship "Ob'" in 1959. In particular, in the last mentioned report it was indicated that the radiation characteristics undergo sharp deflections in transition across the line of Antarctic convergence, once more emphasizing the significance of this line as a remarkable physico-geographic boundary. T. F. Batyayeva and D. I. Stekhnovskiy reported on the average monthly fields of pressure and temperature of the air in the Antarctic and Southern Hemisphere.

The author of the present article reported on climatic zones of Eastern Antarctica. G. M. Tauber gave a detailed analysis of run-off winds of the Antarctic.

The reports of M. G. Burlachenko, entitled: "On the Amounts of Ice Discharged into the Davis Sea," and of Kh. Ya. Zakiyev, entitled: "An Experiment in the Approximate Determination of the Balance of Snow and Ice in Eastern Antarctica" evoked great interest. Initial systematic data on atmospheric electricity in the Antarctic were introduced in the report of T. V. Lobodin. Measurements of the potential

gradient indicated that for winds exceeding 35 m/sec it has a negative value, attaining tens of thousands of volts per meter.

Original results were reported by V. L. Lebedev: examining the spread of pack ice on the aquatorium of Davis Sea during the course of one year he established that a quasi-stationary cyclonic circulation of the atmosphere prevails here; an analogous circulation is noted near the western shelf glacier, also.

It is impossible to describe all the reports in a short article, therefore we shall limit ourselves to mentioning that the final session of the conference was devoted to reports on the methodology of antarctic observations, including methods of determining the height of the ice shield.

On the whole the first scientific conference, reflecting only part of the investigation of the aerometeorology of the Antarctic, showed how far Soviet scientists have advanced in investigation of the Sixth Continent, concerning which not so very long ago there existed only most approximate concepts. ("Scientific Conference on the Meteorology of the Antarctic," by V. A. Bugayev, Izvestiya Akademii Nauk SSSR, Seriya Geograficheskaya, No 2, 1960, pp 133-134) /

Over the South Pole

In an article in Priroda, No 3, March 1960, V. A. Bugayev and Ye. I. Tolstikov report on a flight made by members of the Third Soviet Complex Antarctic Expedition from Mirnyy Station to the US base at McMurdo Sound. [cf. Priroda, No 4, 1959, pp 63-70.]

The Soviet expeditionaries for a long time had wished to see the region around the South Pole from the air to take barometric readings and to ascertain the feasibility of making tractor-sled-train trips over the terrain. Because of the limited range of the available Il-12 aircraft available a flight from Mirnyy Station to the South Pole and return was impossible. The US base at McMurdo Sound was contacted through the US synoptician Morton Rubin who was spending the winter at Mirnyy and the flight was arranged. The aircraft took off from Mirnyy Station at 0800 Greenwich time, 24 October 1958. The pilot had difficulty in maintaining course because of the monotonous terrain and indistinct horizon. The aircraft's position was checked with Mirnyy every hour by radio, from where the plane's position was relayed to McMurdo Sound and to Moscow. At 1205 hours the aircraft passed over a site which is indicated on the map by "Mountains, sighted 1947." Members of the First Soviet Antarctic Expedition, however, flew over this site and established that there actually were no mountains there, but the cloud formations in that area may resemble mountains.

At 1530 hours the aircraft passed over Sovetskaya Station. The pilot dipped his wings and was answered by a discharge of multicolored rockets. At the station is a large building consisting of five cabins

10 to 20 m², connected by a common room. The first cabin is the aerological cabin, inhabited by the aerologist, mechanic and doctor; the second is the radio shack-meteorological cabin, in which the station chief and the radio operator live, and opposite the latter are the cambose cabin and cold storeroom. Across the station is the cabin of the electric power plant, and separated from the other buildings is the aerological pavilion. Two tractors and sleds are visible. As the party flew over the South Pole the pilot circled the pole twice, and noted that the building of the US base Amundsen-Scott was 900 meters from the South Pole, itself. The remainder of the flight to McMurdo Sound was uneventful, passing over monotonous, nearly level terrain.

Again receiving the weather prognosis from the US personnel at McMurdo Sound, the aircraft took off for the return trip to Mirnyy Station at 0900 hours local time. As a result of this reconnoitering trip the Fourth Antarctic Expedition was able to travel from Mirnyy Station, through Vostok Station to the South Pole by caterpillar tractor-sled train during the period 27 September to 26 December 1959. During this trip, which was a great new achievement of the Soviet polar expeditionaries, glaciometric, gravimetric, magnetic and meteorological observations were made at intervals of 100 to 200 kilometers. The thickness of the continental ice was determined with the aid of seismic sounding. The last leg of the trip, from Vostok Station to the Pole, was begun on 8 December 1959 by two "Khar'kovchanka" oversnow vehicles and one caterpillar tractor with four sleds in tow. A group of 16 expeditionary personnel, led by expedition head A. G. Dralkin, set out for the South Geographic Pole. The train arrived at the South Pole on 26 December, conducted scientific work at the pole for three days, and began the return trip on 29 December 1959. ("Over the South Pole," by V. A. Bugayev and Ye. I. Tolstikov, Priroda, No 3, 1960, pp 69-79)

Severnnyy Polyus-9 CPYRGHT

The scientific drifting community "Severnnyy Polyus-9" is just being established. Several times a day aircraft land on the ice. Provisions, fuel, heating fuel, tents and collapsible houses are unloaded. We flew to the new drifting station on an "Il-14," the crew of which is headed by V. P. Veselovskiy.

En route we looked into the crew compartment. We conversed with the pilot, Aleksey Grigor'yevich Sorokin.

"Please notice," he said, indicating an instrument, "we are flying at an altitude of 3,000 meters. The temperature outside is 10 degrees below freezing. At the Lapteva coast, from where we took off, the temperature was approximately 20 degrees below freezing. A warm front is passing overhead -- a herald of heavy fog. One or two hours later the weather may change radically, and then it will not be easy to land on the ice..."

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However, everything turned out all right.

...On the ice I met an acquaintance, Yuriy Valentinovich Kolosov. He is an engineer-meteorologist. Seven months ago I saw him on the "Severnny Polyus-6" drifting station. That was the eve of the day on which the group of the drifting scientific community left the ice island in the Sea of Greenland.

"I rested for several months," he said, "and again I am in the Arctic. I am not alone," added Yuriy Valentinovich. "Our hydrologists Nikolay Vasil'yevich Pen'yevskiy, Yakov Markovich Korpich and Yuriy Fedorovich Morozov will be drifting on the ice for the third time. Engineer-mechanic Dmitriy Ivanovich Anyutin has been wintering in the Arctic for several years, and hydrologist Vladlen Vasil'yevich Izmaylov has repeatedly participated in many sea expeditions."

"Each of us," continued Kolosov, "now has very much work to do. We must build houses, set up tents, get an electric power station going, equip a radio shack and a wardroom. Although we still do not have a galley, our food is good and hearty," the polar expeditionary added jokingly. "Our cook Ivan Petrovich Fedorov is a novice in the Arctic, but this has no effect upon his specialty. Ivan Petrovich knows many people from Leningrad, where he was chef of the restaurant 'Astoriya.'"

The commandant of "SP-9" Vladimir Aleksandrovich Shamont'yev has participated in many high-latitude and sea expeditions. We met him in a low, round tent. Here a command point is set up for receiving aircraft from the Mainland.

The roar of an approaching aircraft is heard.

"Let us go meet it!" invites Vladimir Aleksandrovich. It is only two steps to the airfield.

"It would be interesting to know the thickness of the ice."

"We are as safe here as on the continent. It is reliable.

The high-latitude expedition "North-12" took care of that. The air-men Moskalenko and Serdyuk, expedition head Nikitin and others spent more than sixty hours in the air finding an ice island of 5 to 6 square kilometers.

The thickness of the ice floe is quite sufficient and reliable. It is interesting that at present the depth of the ocean below us is only approximately two hundred meters. At present we are drifting over the continental shoals. However, when the ice floe carries farther to the north the depth of the ocean will be several thousand meters..."

The scientists will have to stand a hard watch far off from the homeland. At present the sun is shining for them, but within a few months the polar night will arrive. Furious snowstorms will rage and burning frosts will strike. All the participants on the ice drift are aware of this. But they also know that their investigations are needed by the Soviet people. The grim weather of the Arctic must be conquered. ("Severnny Polyus-9," by Stepan Khomenko, Nedel' supplement to Izvestiya, 17-23 April 1960, p 7)

Voyage Around the World CPYRGHT

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At the beginning of the week the flagship of the Soviet antarctic expedition, the "Ob'," a Diesel-electric ship of the icebreaker class, docked at the port of Odessa which, having rounded the south polar continent, not long ago arrived in the Atlantic at the same coordinates where it had been 136 days earlier. Thus for the first time in the history of science in a single navigation it accomplished a daring round-the-world voyage in the high antarctic latitudes within a period of only three and one-half months.

On the map published today, drawn by artist A. Vedernikov, the route of the "Ob'" is indicated by a black broken line.

Now the unheard-of ice expedition, which has great scientific importance, for the first time has been crowned with complete success.

Leaving the antarctic waters, the seamen and scientists sent the following radiogram to their friends remaining for the winter in the Antarctic at Mirnyy:

"Dear Comrades! Astern the "Ob'" the grandiose cliffs and ice floes disappear into the fog. The course is set for the north. We are leaving the Antarctic. At this minute our thoughts and best wishes fly to you along the meridian antipode through the entire ice continent and South Pole. We wish you cheerfulness, optimism, good health, a rapid passage of time and furtherance of the beautiful matter of investigation of the sixth continent. Soon, soon we again shall quit our native shore and head south to meet with you..." ("Voyage Around the World," unsigned, Nedel' supplement to Izvestiya, 17-23 April 1960, p 13)

A Radio Message From Mirnyy Station

For more than four months members of the fifth complex antarctic expedition have been working at scientific-research stations on the Sixth Continent. During this time the scientists have conducted much interesting work. Ye. S. Korotkevich, head of the expedition, reports the following:

Our aviation section, which is led by the experienced polar aviator A. N. Pimenov, recently has been occupied with supplying all necessary provisions for normal operation during the winter period to the Vostok East inland continental station. Eleven polar scientists are conducting observations at this station.

Flights to the interior of the continent have been conducted under difficult meteorological conditions and at low temperatures. It is interesting to note that the March average temperature at the Vostok Station was minus 61.8 degrees Centigrade.

Having completed polar operations in Queen Maud Land and having conserved the mountain camp of the geological-geographical section and the tractor-sled train, its complement returned to Lazarev Station. They then were transported by air to Mirnyy.

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At present the polar scientists are preparing for winter. Its icy breath is felt more and more strongly. The first harbingers of winter arrived at Haswale Island -- four imperial penguins. This was the advance guard. Four days later the first large group appeared. At present the colony of imperial penguins numbers approximately 20,000 birds.

A snowstorm broke out and lasted for days. When it ended Mirnyy was covered with a one-half-meter layer of snow.

The tractor-sled train of the Komsomol'skaya-Mirnyy inland continental stations, headed by transportation section chief B. A. Krasnikov, arrived at the Mirnyy South Pole observatory after a 43-day trip along the Mirnyy route. It had covered a distance of more than 1,700 kilometers. With three heavy tractors drawing trailer sleds the polar expeditionaries brought fuel to Komsomol'skaya Station which will be necessary during the spring-summer trips into the interior of the icy continent. In addition, during these trips the scientists conducted many interesting observations. ("Mirnyy Radio Message," unsigned, Izvestiya, 28 April 1960, p 1)

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